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REPORT ON THE

LASCO THINNING PROJECT

Lassen National Forest
October 14 to December 14, 1933

By

RUSSELL W. BOWER
Junior Forester
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February 1, 1934

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Introduction

A thinning project on a small scale was undertaken in the east-side Jeffrey-ponderosa pine type on the Lassen National Forest, on October 15, 1933. Work was carried on by a small crew located at Lasco Camp until severe storms brought it to a close on December 15, 1933.

The purposes of this project were: (1) the development of a method of operation; (2) the development of thinning practices; and (3) the determination of probable costs for an extensive program of thinning work to be undertaken on this timber type at a later date.

For the purpose of consistency, the terms used in connection with thinning in this report are those defined (in part) by Graves¹ as follows:

1. Cleaning: Removal of trees of inferior species and poor form to release other good trees. The term as used in this report also includes defective, insect infested and diseased trees.

¹Graves, H. S., Principles of handling woodlands, Chap. VI.

2. Thinning: Removal of trees to reduce the density of the canopy to give more favorable growing conditions to the best trees. Thinning is also used as a general term for the entire operation.

Description of the Area and Stand

Area. All thinning was confined to Section 36, T. 30 N., R. 8 E., M.D.M. This section was acquired by exchange from the Lassen Lumber and Box Company. It was clear cut and logged with horse wheels, the S.E. $\frac{1}{4}$ in 1920 and the N.E. $\frac{1}{4}$ and N.W. $\frac{1}{4}$ in 1921. Logging slash was left in piles and windrows without burning. The elevation of the area is about 5300' with a gentle general slope to the south. It is characterized by low rocky ridges (lava caps) of poor shallow soil interspersed with wide swales of good, deep soil. The area is classified as Site IV.

Stand. The stand consisted of about 99 per cent Jeffrey-ponderosa pine (Pinus jeffreyi and Pinus ponderosa) and 1 per cent white fir (Abies concolor) and lodge-pole pine (Pinus contorta).

The trees ranged in size from about 2 feet to 20 feet in height. The age ranged from 12 to 80 years with considerable variation within each height class.

A mixed stand of snow brush (Ceanothus velutinus) and manzanita (Arctostaphylos patula) was found in the north central portion of the section.

Stocking was very irregular; dense thickets alternating with wide openings characterized the entire area. The openings

were of two types: rock flats, incapable of supporting tree growth; and wide openings, with excellent soil where the young stand was destroyed at the time of logging, or where reproduction was absent at the time of logging because of too much shade.

The openings of the second type had no chance to reseed because of complete removal of seed trees by logging; practically all of stands thinned were present at the time of logging in a suppressed, or partially suppressed form. Annual rings of the trees cut, show a sudden increase in width after logging as a result of complete release by the clear cutting. Some reproduction subsequent to logging (mostly Jeffrey pine) was found on the railroad grades and in the vicinity of landings, - evidently from seed and squirrel caches in the ground at the time of logging.

Organization of Work

Crew. To start with, the crew consisted of 4 cutters, 1 tallyman and 2 markers. Most of the marking was done by forest officers.

After marking was discontinued, two crews consisting of 3 cutters and 1 tallyman each, were used. One forest officer supervised both crews.

Strips. The level topography made it very simple to lay out the work in 10 acre strips (10 chains square) without interfering with the speed of the operation, because they could be worked

in any direction. The 10 acre units were especially valuable in summarizing the results of the cutting.

Marking. All of the N.E. $\frac{1}{4}$ (40 acres) was marked by forest officers before cutting. Each tree to be left was marked with a small piece of red cloth. Three cutters could cover the area marked by one man in one day.

The marking was discontinued because it was apparent that it would require too much over-head to be done on a very large scale. It also took in all the supervising officers time, allowing no time for direct supervision of the cutting. The use of a laborer as a marker was tried but found unsatisfactory. It also tended to slow up the speed of the cutters.

After marking was discontinued, the cutters were allowed to choose the trees to be saved. Although their choice was not exactly right in many cases, on the whole the results were satisfactory.

Important. Marking may be used to very good advantage in breaking in and training an inexperienced crew.

Cutting. The cutters spread out over about a $2\frac{1}{2}$ chain strip and worked back and forth over the ten acre squares, cutting all trees necessary and counting the trees remaining. They used brush hooks almost entirely. Axes were used only when there were many trees over 6 inches at the stump that needed to be taken out.

Tallying. The tally man stationed himself at about the center of the strip being cut and recorded all trees cut and left as called in by the cutters. He also watched for patches missed and for injured tops missed. Tally sheets were changed daily

and for each ten acre strip. The information obtained from the tally was deemed valuable enough to warrant keeping it for the entire project. It gave an accurate measure of each days work; an excellent inventory of the stand before and after cutting; the relationship between density of stand and degree of thinning, and causes of variation.

Records. In addition to the regular time and camp records, a daily summary of work done and a progress map of 10 acre strips was kept. The daily summary was kept under the following headings:

Date :	Number	:	Number	:	Acres worked	:	Man hours
:	trees cut	:	trees left	:		:	(Day only)
Day	To date	Day	To date	Day	To date	Cut	Tally Other

Thinning Practices

A combination of cleaning and thinning was carried on throughout the area. The cut ranged from 49 per cent to 74 per cent of the stand, varying with density, size of the trees, and presence or absence of brush and inferior species.

Cleaning. The types of trees removed under the operation classified as "cleaning" are as follows:

1. Defective. Trees with insufficient crown, poor form, broken tops, forks, excessive crook, and bad scars.

These were removed only when there were others to take their places. A great many trees fell into this class on this area.

2. Porcupine injured. Trees in the open (and usually small) were attacked usually at the base. When completely girdled they were, of course, dead or dying and were given no consideration. Trees only partially girdled ~~were~~ left. Trees attacked near the tops, (usually in thickets and the dominant trees) and completely girdled were removed in practically all cases. Partially girdled trees were left if there were no better trees to save.

While the damage from porcupines was quite evident on some parts of the area worked, it was not of great importance over the area as a whole. Only a very slight percentage of the quarter million trees cut were injured in any way from this cause through the period since logging.

3. Damaged by Stock. A very few trees were found with parts of the needles and in some cases the terminal shoots cropped off.
4. Insect infested. A pitch moth ? () was found destroying the terminal shoots on young Jeffrey pines. On some trees, as many as a dozen terminal shoots were destroyed as soon as formed, giving the tree a very stunted widely branched appearance. This

type of work was especially noticeable in the young Jeffrey pines (3 feet or under in height) in the vicinity of the railroad grades and landings. Some damage was found in the shoots at the ends of branches in larger trees on other parts of the area. The trees with the terminal shoots destroyed were removed where there were any other trees at all to take their places.

A number of trees were found infested with a bark boring Buprestid and a pine weevil. (Species not determined). These trees were removed and burned.

5. Mistletoe infested. A few small areas of reproduction were found heavily infested with pine mistletoe (*Razoumofskya* sp.) Trees with mistletoe in the main stems were removed entirely and infested limbs were lopped from other trees where possible.
6. Inferior species. White fir and lodge-pole pine were removed when in competition with Jeffrey or ponderosa pine.

Thinning. Thinning consisted of removing the suppressed, intermediate and enough codominate trees to give an average spacing of 6 feet. Dominance was given preference over spacing to a minimum of 3 feet spacing. Under that, a codominate or other tree was saved instead of a dominate to give better spacing.

Preference was given to Jeffrey pine over ponderosa pine if the trees were nearly equal in size and dominance because the Jeffrey pine was apparently the faster growing and huskier tree on this area.

Other. While a few large trees (mostly unmerchantable) were left from logging that were shading some reproduction, they were so scattered that no felling crew could be used to advantage, so none were cut.

Trees were not cut where growing up through brush because it was decided that their removal would give release effect to the brush instead of the adjoining trees, and in most cases the brush was being killed out by the trees.

No brush was cut to release young trees.

5. Slash Disposal

Slash was lopped and scattered throughout the area. While it undoubtedly adds a great deal to the fire hazard on this area, it is possible that burned area may still be kept to the minimum because the area is directly visible from a primary lookout, and can be reached in twenty-five minutes from the nearest guard station. Also the level topography and the presence of wide openings in the stand tend to reduce the danger from fire.

This type of slash disposal is of great advantage because of the relatively large money saving and the fact that it will probably add a great deal to the formation of duff (already noted as scanty or wanting in this area.)

Complete disposal by piling and burning was tried on the area of 4 acres. The cost of labor amounted to \$3.30 per acre or

almost equal to all the other thinning costs combined.

Sample strips were left uncut as indicated on the map accompanying this report.

The mistletoe infestation in the S.E. $\frac{1}{4}$ of the N.E. (indicated on the map) may be of interest because it is located in a limited area about two large trees containing witches brooms, apparently the source of the infestation.

A small area of lodge-pole in the S.W. $\frac{1}{4}$ of the N.W. $\frac{1}{4}$ (indicated on the map) may be of interest because in a portion of the stand a complete understory of lodge-pole pine was removed to release some fairly well spaced but very badly suppressed ponderosa pines. The possibility of planting in the wide openings where there are good soil conditions should be given some consideration.

Results of Cutting

The cutting results were summarized by 40's because the variation in results on a daily basis and on the ten acre strips was too great to show the desired relationships. The summary by 40's is arranged with respect to total original stand per acre.

The man-hour time unit was used so results could be estimated for, or compared with crews working on either a six or eight hour day basis. Only the man hours cutting was used because the results depended entirely on the speed and efficiency of the cutters.

Height classes were taken from estimates made in the field.

Snow to the depth of 10 inches was encountered on part of the area but apparently had no effect on the speed of the work.

The degree of thinning (per cent of stand removed) varies with density of the original stand, - modified by size, presence of brush, and occurrence of the trees in large thickets, in small thickets or scattered singly.

The speed of cutting (trees cut per man-hour) varies with density of the original stand, degree of thinning, size of trees and cutting practice (marking vs. not marking).

The area covered per unit of time (acres per man-hour) varies widely with density of original stand, degree of thinning and speed of cutting.

Trees cut per unit of time (100 per cent variation) is a much better index of work done than area covered. (400 per cent variation).

The average stocking after thinning appears low, but as

noted before, this results from the irregular distribution.

Results of cutting.

Summary of cut by 40's.
Acre basis

				:Per cent:				
40 and : Total stand:		Trees cut:		Trees left:		of stand:		Man hours:
net acres:		per acre :		per acre :		removed :		Trees cut : Acres cut
								per man hour : per man hour
								Remarks
NE NE								Average height 6 feet (est)
40	1548	1146	402	74	248	185	.17	Marked for cutting.
SE NE								
38	1137	744	393	65	120	236	.32	Average height 6 feet
NE SE								Average height
40	932	648	284	69	141	184	.28	over 6 feet
SE NW								Brushy
39	839	452	387	54	79	223	.49	average height 6 feet
NW NE								
40	827	553	274	67	123	180	.33	average height over 6 feet.
NE SW								Brushy
10	595	388	207	65	27	144	.37	Average height over 6 feet.
SW NE								Brushy. Height 6 feet
35	587	291	296	49	53	192	.66	Wide openings
SE SE								
38	577	377	200	65	86	166	.44	Height over 10 feet.
NE NW								
40	534	330	204	61	91	145	.44	Average height 10 feet.
NW SE								
40	506	334	172	66	92	145	.43	Average height 10 feet.
SW NW								Axes used on larger trees.
40	477	302	175	63	103	117	.39	Average height 20 feet.
SW SE								
38	459	293	166	63	72	154	.53	Height over 10 feet.
NW NW								
40	436	257	179	59	67	153	.60	Average height 10 feet.

Summary for entire area

478	737	477	260	64.7	1302	175	.36
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Total number of trees cut - 228,369

Number of trees left - 123,919

Costs

<u>Thinning</u>	<u>Total costs</u>	<u>Costs per acre</u>
Cutting	\$ 716.10	\$ 1.50
Tallying	240.90	.50
Transportation - Gas, oil, repairs, labor etc.	56.82	.11
Supervision - Forest officers salary and expense	576.21	1.21
Miscellaneous - Marking, brush burn, etc.	31.85	.07
Total	\$ 1621.88	\$ 3.39

Other

Loss on cookhouse	257.61	
Camp expenditures - Rent, wood- cut, establishing and breaking camp.	90.40	
Total	\$ 348.01	\$.73
Grand total	\$ 1969.89	\$ 4.12

Expenditures from Lassen Improvement Allotment \$ 1559.89

Contributed costs 490.00
2049.89

Less inventory of equipment and
supplies purchased from allotment 80.00
\$ 1969.89

The results on this project indicate that this type of work on similar areas may be done at a very reasonable cost when done on a very extensive basis. Elimination of tallying and a greater spread of supervision costs would bring the figure down, but if complete slash disposal is necessary the cost would be increased considerably.

Recommendations for Future Work

Organization of field work

1. Crew. Crews of 10 to 15 men may be handled by one foreman. More than ten men per foreman should be used only if part of them are used in felling or on slash disposal.
2. Strips. Cut by 40's or $\frac{1}{4}$ sections.
3. Marking. Used only to break in crews.
4. Cutting. Brush hooks are the most efficient tools on trees up to 6 inches stump diameter. For trees 6 inches to 12 inches axes may be used. For trees over 12 inches a felling crew should be used. The men should work fairly close together ($\frac{1}{2}$ chain strip per man) and stay about even when advancing through the stand. Steep topography may be worked to the best advantage up-hill at right angles to the contours.
5. Tallying. Should be used at intervals to check the speed

of the crew and the degree of thinning. For more exact information use sample strips or plots.

6. Records. At least a weekly (5 day) summary of work accomplished should be made and an accurate progress map kept up for the same period.

7. Camps. Any camps contemplated in this type of stand should take into consideration that 30 cutters will cover from 50 to 75 acres a day, making necessary either an extensive area available to one camp or frequent movements of camp.

THINNING PRACTICE

Summary of all

1. Take out all defective trees (insufficient crown, poor form, broken tops, forks, excessive crook, badly scarred, porcupine injured, stock damaged) unless there are no other trees capable of occupying the spaces.
2. Take out all insect infested trees and destroy them when possible.
3. Take out trees with boles, infested with mistletoe and remove infested limbs from others when possible.
4. Take out inferior species when in competition with the better species.
5. Take out suppressed, intermediate and enough codominant trees to give an average spacing of 6 feet. Dominance should be given preference over spacing to a minimum of 3 feet.
6. Cut no trees that are coming up through brush.
7. Cut no brush to release young trees.
8. In cutover areas where there is a considerable overstory of reserve stand and seed trees, a felling crew may be used. If so they should cut only unmerchantable trees that are competing with good young growth. Some insect infested or mistletoe infested trees may need to be cut.
9. Important. Cutters as a rule, are inclined to cut too much in thin stands and not enough in the densest stands. They are also inclined to cut too many trees on the edges of thickets.

10. Cut nothing under 18 inches in height. It may be necessary to cut smaller ones in the thickets incidental to taking out others.

11. Slash Disposal. Lop and scatter if at all possible.

REFERENCES

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Principles of handling woodlands.

Show, S. B.

Timber growing and logging practices, in the California pine region. U.S.D.A. Bulletin # 1402.

Korstian, C. F.

The western yellow pine mistletoe.
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Keen, J. P.

Insect enemies of the California pines and their control.

Appendix

Photographs

Maps

Photo No. 1

Pine thicket before thinning. This photo shows the type of stand worked in. Note the wide openings. Logging slash in lower right foreground. Note the tree indicated by arrow and cross and refer to the following photograph.

Photo No. 2

The same thicket after thinning. Although more than 50 per cent of the trees have been removed the canopy area has been reduced very little (with exception noted below) and the openings made will be occupied by the crowns of the trees remaining. Note that the slash from thinning has not covered much of the opening. Note that the tree indicated in the previous photo has been removed. This tree should have been left in spite of a butt scar and a crooked stem, because its removal reduced the total canopy area and there is no other to take its place.

Lassen Stand Impr
Sec. 36, -30N 8E

Form 974.

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